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Description of an invention
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[(Patent Application.)]

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Applicant: "Mikrokhirurgiya Glaza" (microsurgery of the eye), a multidisciplinary scientific and engineering institute.

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UDC classification: 615.475(088.8).

Prior art documents to be taken into account: US 4537263, 1985, Classification A16B 17/04 [sic -- possibly should be "A61B 17/04"].

Title: Head for an automatic device for emplacing a surgical suture.

Abstract: Area of applicability: Medicine. Essence of the invention: The head assembly is comprised of an arcuate needle guide, a needle advancing mechanism, and a drive means, whereby the needle is forcibly advanced in order to pierce the tissue being sutured, and is further forcibly advanced with appreciable force.

(Total of 2 Figures.)

[Specification]:

The invention relates to the area of technology of medicine, particularly surgery.

Surgical suturing apparatuses are known which are comprised of a body, a needle-shaped implement, a housing for surgical staples, a lever member, and an advancing mechanism.

Such known apparatuses have drawbacks relating to the continuity of the suturing process, the complexity of the apparatus design, the excessive size and related inconvenience of the working part, and the use of staples instead of sutures.

Also known is a suturing apparatus comprised of a body with a working part comprised of: an arcuate needle guide, and a needle advancing mechanism which is mounted on a shaft.

Such an apparatus has the drawback of impossibility of automatic suturing over the entire extent of the incision (wound) in the biological tissue, as a consequence of unavoidable slippage of rolls of the needle advance mechanism which rolls serve to advance the needle, resulting in impossibility of automatic fixing of the moment of exit [sic] of the needle from the tissue. Additionally, the force which can be delivered is limited, as a consequence of the fact that it is determined solely by the friction of the needle against the roller (under conditions of small surface area of the needle).

The object of the invention was to devise means of shortening the time of emplacement of the suture, simplifying the design [of the assembly], and facilitating the operation.

This object is achieved in that,
in a known type of apparatus, comprised of a body having a working part in the form of an arcuate needle guide, and further comprised of a needle advancer (needle advancing mechanism) which is disposed on a shaft,
the head assembly is comprised of:
-- a mechanism for moving (driving) the working part, said mechanism comprising a bushing which is mounted on a hollow shaft which is connected with the body, with the possibility of turning, and, further
-- a detent which is rigidly fixed to the surface of the bushing at its (said detent's) first end and is connected to the body at its second end with the possibility of axial movement, and
-- rod-like main guiding supports rigidly connected to the bushing, which supports bear the arcuate needle guide which needle guide comprises a strip with rod-like terminal members which terminal members are disposed opposite to the rod-like main guiding supports, wherewith the lateral surfaces of the main guiding supports and the terminal members are [all] parallel; and
-- additional (auxiliary) rod-like guiding supports which are disposed at the middle of the strip, which supports are connected to

a tapered (wedge-shaped) detent plate, which auxiliary supports, along with the rod-like main guiding supports, are oriented to [sic] the lateral surface of the needle advancer; wherewith

-- the needle advancer is in the form of a circular sector piece which is rigidly connected to the shaft, which sector piece bears tapered (wedge-shaped) plates disposed at an angle to the lateral surface, which plates are spring-like (or spring-loaded); and wherewith

-- the shaft is mounted in an antifriction bearing which is in turn mounted in the bushing, and (said shaft) is disposed in the interior space of the hollow shaft and the body, with the possibility of being displaced axially.

Figs. 1 and 2 show a set of views [(lateral, front, and perspective front)] of a head assembly for an automatic device [, according to the invention].

The head assembly for an automatic device is comprised of:

-- a body 1 having a working part in the form of an arcuate needle guide 2 and a needle advancer 4 which is disposed on a shaft 3, and

-- a mechanism for moving (driving) the working part, said mechanism comprising a bushing 5 which is mounted on a hollow shaft 6 which is connected with the body 1 with the possibility of turning, and, further

-- a detent 7 which is rigidly fixed to the surface of the bushing 5 at its (detent 7's) first end and is connected to the body 1 at its second end with the possibility of axial movement, and

-- rod-like main guiding supports (8, 9) rigidly connected to the bushing 5, which supports bear the arcuate needle guide 2 which guide 2 comprises a strip 10 with rod-like terminal members (11, 12) which members are disposed opposite to the rod-like main guiding supports (8, 9), wherewith the lateral surfaces of the guiding supports (8, 9) and the terminal members (11, 12) are parallel.

Additional (auxiliary) rod-like guiding supports (13, 14) are disposed at the middle of the strip 10 which supports are connected to a tapered (wedge-shaped) detent plate 15, which auxiliary supports (13, 14), along with the rod-like main guiding supports (8, 9), are oriented to [sic] the lateral surface of the needle advancer 4. The needle advancer 4 is in the form of a circular sector piece 16 which is rigidly connected to the shaft 3, which sector piece 16 bears tapered (wedge-shaped) plates 17 disposed at an angle to the lateral surface, which plates 17 are spring-like (or spring-loaded). The shaft 3 is mounted in an antifriction bearing 18 which is in turn mounted in the bushing 5 and (said shaft 3) is disposed in the interior space of the hollow shaft 6 and the body 1, with the possibility of being displaced axially.

The body 1 is intended to link the head assembly (for the automatic device) to the drive means which provides rotational and forward-and-reverse rotational movement (respectively) to the hollow shaft 6 and the shaft 3. The arcuate needle guide 2 serves to hold the needle when the needle is withdrawn from the tissues being sutured, and to advance [sic] the needle via the spring-loaded

tapered (wedge-shaped) plates 17 and to aid in the exertion of mechanical force by said plates 17.

The shaft 3 serves to transmit forward and reverse rotational movement to the needle advancing mechanism 4 and to the circular sector piece 16. The needle advancer 4 serves to transmit mechanical force and advancing movement to the needle via the spring-loaded tapered (wedge-shaped) plates 17.

The bushing 5 and the hollow shaft 6 serve to convert rotational movement of the hollow shaft 6 to advancing movement of the working part of the head assembly (for the automatic device) longitudinally along the incision (wound) which is being sutured, at a time when the entirety of the needle is disposed on the spring-loaded tapered (wedge-shaped) plates 17, and is outside of the tissue which is to be sutured.

The detent 7 prevents the bushing 5 from rotating along with the hollow shaft 6. The rod-like main guiding supports (8, 9) serve to support the arcuate needle guide 2 and to prevent movement of the needle in the transverse direction. The strip 10 and the rod-like terminal members (11, 12) serve hold the needle on the tapered (wedge-shaped) plates 17 and to prevent movement of the needle in the transverse direction.

The auxiliary supports (13, 14) serve to hold the tapered (wedge-shaped) detent plate 15 to the strip 10, and to prevent movement of the needle in the transverse direction. The tapered (wedge-shaped) detent plate 15 allows advancing movement of the needle in one direction only along an arc over the spring-loaded tapered (wedge-shaped) plates 17 when said plates 17 are being moved in forward-and-reverse rotational movement along with the circular sector piece 16 and the shaft 3.

The circular sector piece 16 and the spring-loaded tapered (wedge-shaped) plates 17 serve to transmit advancing movement to the needle, and to transmit mechanical force from the shaft 3 which is moved in forward-and-reverse rotational movement. The antifriction bearing 18 serves to provide for advancing movement of the shaft 3 along with the bushing 5, longitudinally along the incision (wound) which is being sutured, while allowing independent rotational movement of the shaft 3 with respect to the bushing 5.

The head assembly for an automatic device operates as follows:

Shaft 3 is driven in forward-and-reverse rotational movements of c. 10° (angular displacement), by drive means (not shown); these excursions each slightly exceed the distance between successive spring-loaded tapered (wedge-shaped) plates (17, 17) along the [peripheral] arc of the circular sector piece 16. These movements executed by the circular sector piece 16 are transmitted to the spring-loaded tapered (wedge-shaped) plates 17, the edges of which are disposed in recesses of the needle, whereby the needle itself is moved in its

clockwise forward path. When the spring-loaded tapered (wedge-shaped) plates 17 are moved in the opposite direction (counterclockwise), the needle is not carried along with (is not moved along with) said plates 17, because the needle is held on the bushing 5 [sic], by means of the tapered (wedge-shaped) detent plate 15; and/or the needle is not so carried along as a consequence of pressure exerted on the needle by the tissues which are being sutured (which pressure resists such carrying along). When the needle is disposed in its upper position distant from the tissues being sutured, the shaft 3 stops moving, and at that moment a rotation of the hollow shaft 6 causes the bushing 5 (along with the elements connected to it and to the needle) to be displaced longitudinally along the incision (wound) which is being sutured, such displacement being by a fixed distance (step) equal to the pitch of the stitch being deposited. After this, the forward-and-reverse rotational movement of the shaft 3 is resumed, and the above-described operating cycle is repeated.

Thus, the use of the proposed head assembly for an automatic device enables time savings in the suturing process, while exerting sufficient forces on the needle to suture not only soft biological tissues (but tougher tissues as well). The head assembly for an automatic device is simple and easy to operate and maintain.

Patent claim:

A head assembly for an automatic device for emplacing a surgical suture, comprised of a body having a working part in the form of an arcuate needle guide, and further comprised of a needle advancer (needle advancing mechanism) which is disposed on a shaft; characterized in that,

with the aim of shortening the time of emplacement of the suture, simplifying the design, and facilitating the operation, the head assembly is comprised of:

-- a mechanism for moving (driving) the working part, said mechanism comprising a bushing which is mounted on a hollow shaft which is connected with the body, with the possibility of turning, and, further

-- a detent which is rigidly fixed to the surface of the bushing at its (said detent's) first end and is connected to the body at its second end with the possibility of axial movement, and

-- rod-like main guiding supports rigidly connected to the bushing, which supports bear the arcuate needle guide which needle guide comprises a strip with rod-like terminal members which terminal members are disposed opposite to the rod-like main guiding supports, wherewith the lateral surfaces of the main guiding supports and the terminal members are parallel; and

-- additional (auxiliary) rod-like guiding supports which are disposed at the middle of the strip, which supports are connected to a tapered (wedge-shaped) detent plate, which auxiliary supports, along with the rod-like main guiding supports, are oriented to [sic] the lateral surface of the needle advancer; wherewith

-- the needle advancer is in the form of a circular sector piece which is rigidly connected to the shaft, which sector piece bears tapered (wedge-shaped) plates disposed at an angle to the lateral surface, which plates are spring-like (or spring-loaded); and wherewith

-- the shaft is mounted in an antifriction bearing which is in turn mounted in the bushing, and (said shaft) is disposed in the interior space of the hollow shaft and the body, with the possibility of being displaced axially.

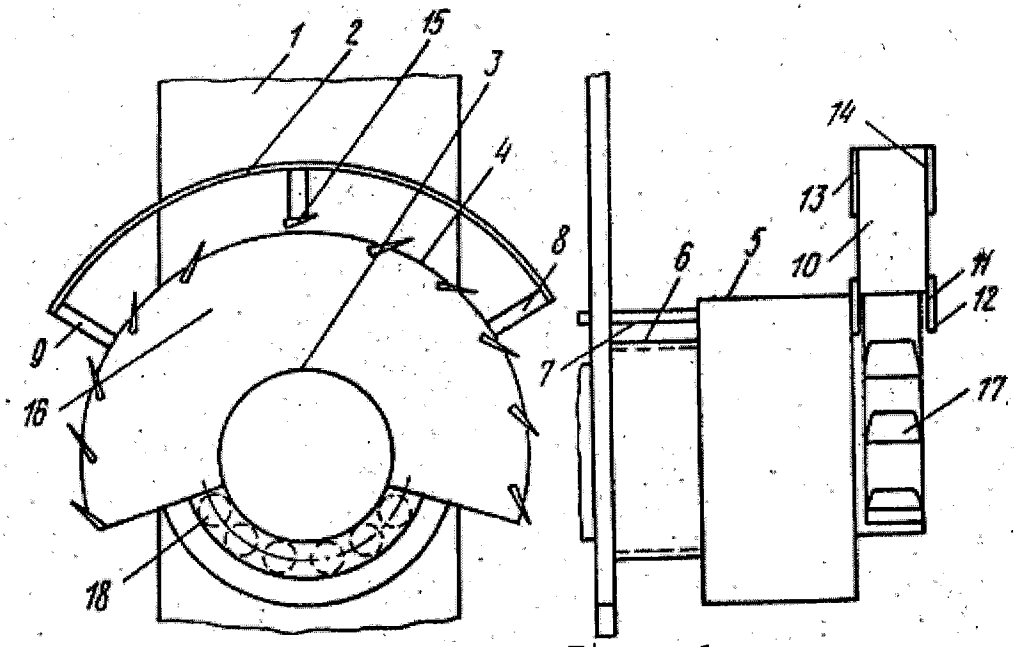

Figure 1

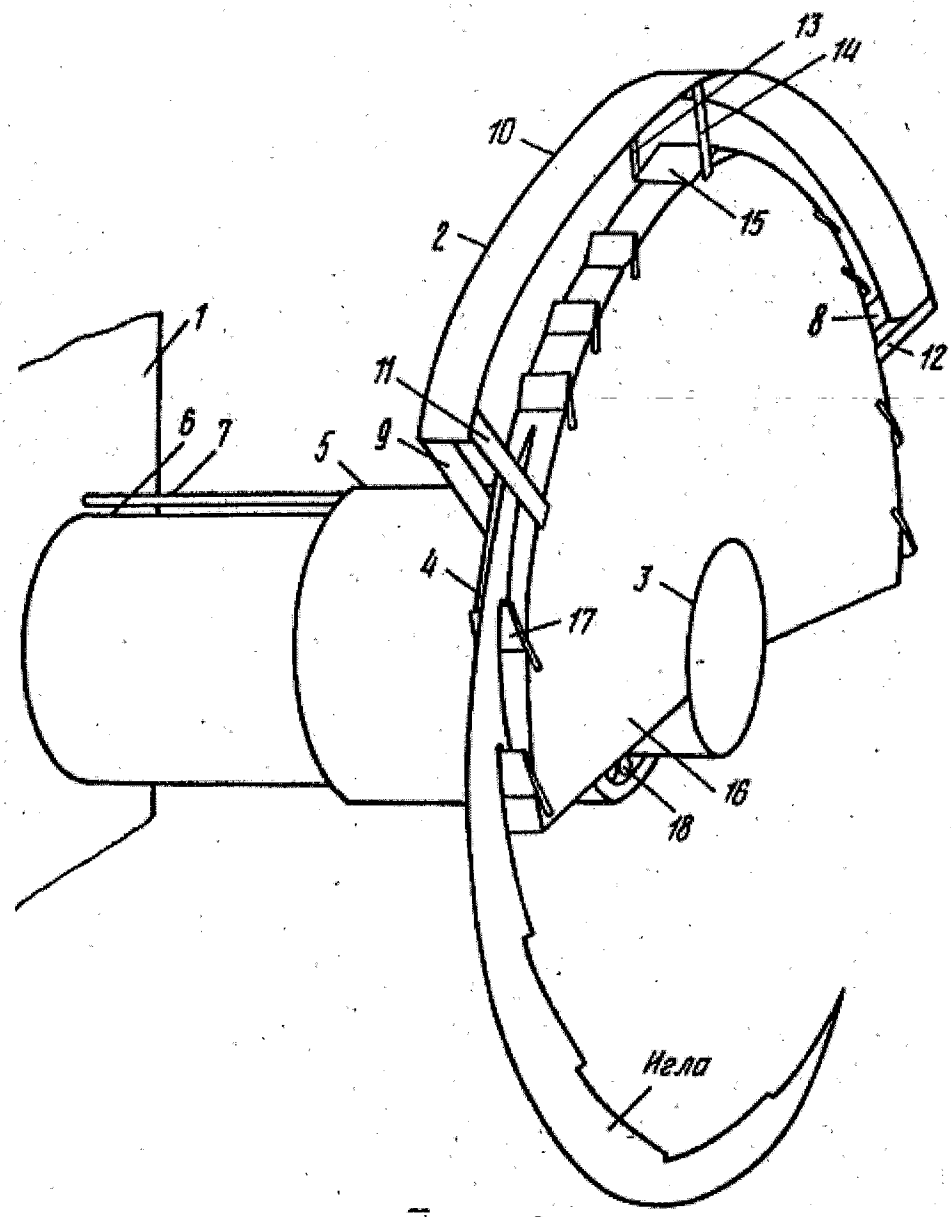

Figure 2

Translator's footnotes to translation of USSR patent application SU 1745214 A1, from Russian to English:

(Numbers at left are the sequential footnote number followed by the Russian column page number followed by a section number (a to f). E.g., "3:2c." signifies footnote 3, relating to Russian Col. 2, namely section c of an imaginary six sections in Russian Col. 2.)

1:1. Surgical suturing apparatuses are known which are comprised of a body, a needle-shaped implement, a housing for surgical staples [(may also mean "a bracket-shaped housing")], a lever member, and an advancing mechanism.

2:2b. This object is achieved in that,
in a known type of apparatus, comprised of a body having a working part in the form of an arcuate needle guide, and further comprised of a needle advancer (needle advancing mechanism) which is disposed on a shaft,
the head assembly is comprised of:
-- a mechanism for moving (driving) the [said] working part, said mechanism comprising a bushing [(evidently threaded with respect to the hollow shaft)] which is mounted on a hollow shaft which is connected with the body, with the possibility of [said hollow shaft] turning, and, further
-- a detent which is rigidly fixed to the surface of the bushing at its (said detent's) first end and is connected to the body at its second end with the possibility of axial movement, and
-- rod-like main guiding supports rigidly connected to the bushing, which supports bear the arcuate needle guide which needle guide comprises a strip with rod-like terminal members which terminal members are disposed opposite to the rod-like main guiding supports, wherewith the lateral surfaces of the main guiding supports and the terminal members are [all] parallel; and
-- additional (auxiliary) rod-like guiding supports which are disposed at the middle [along the length] of the strip, which supports are connected to

-- Col. 3 --

a tapered (wedge-shaped) detent plate, which auxiliary supports, along with the rod-like main guiding supports, are oriented [perpendicularly] to the [radially] lateral surface of the needle advancer; wherewith
-- the needle advancer is in the form of a [disc-like] circular sector piece which is rigidly connected to the shaft [(the main shaft, not the hollow shaft)], which sector piece bears tapered (wedge-shaped) plates [(advancing plates)] disposed at an angle to the [radially] lateral surface [of said sector piece], which plates [(advancing plates)] are spring-like (or spring-loaded); and wherewith
-- the [(main)] shaft is mounted in an antifriction bearing which is in turn mounted in the bushing, and (said [main] shaft) is disposed in the interior space of the hollow shaft and the body, with the possibility of being displaced axially [in space] [(e.g. the possibility of the main shaft (and the bushing) being displaced axially)].

3:3b. The head assembly for an automatic device is comprised of:
-- a body 1 having a working part in the form of an arcuate needle guide 2 and a needle advancer 4 which is disposed on a shaft 3, and
-- a mechanism for moving (driving) the [said] working part, said mechanism comprising a bushing 5 [(evidently threaded with respect to the hollow shaft 6)] which is mounted on a hollow shaft 6 which is connected with the body 1 with the possibility of [said hollow shaft 6] turning, and, further
-- a detent 7 which is rigidly fixed to the surface of the bushing 5 at its (detent 7's) first end and is connected to the body 1 at its second end with the possibility of axial movement, and
-- rod-like main guiding supports (8, 9) rigidly connected to the bushing 5, which supports bear the arcuate needle guide 2 which guide 2 comprises a strip 10 with rod-like terminal members (11, 12) which members are disposed opposite to the rod-like main guiding supports (8, 9), wherewith the lateral surfaces of the guiding supports (8, 9) and the terminal members (11, 12) are [all] parallel.

[Translator's note: It is somewhat apparent that the "needle advancer" 4 is the entire configuration borne on the sectoral disk 16, and that the needle itself (Russian "igla") is the generally crescent-shaped piece at the bottom of Fig. 2, which piece has a series of sawtooth-like ramps on its inner border, and is labeled "igla" but does not bear a reference numeral.

Thus, the reference numeral 4 in Fig. 2 should bear an arrowhead to indicate that it represents the entire substructure of the device and in particular does not represent the needle (which needle is not deemed part of the device).]

Additional (auxiliary) rod-like guiding supports (13, 14) are disposed at the middle [along the length] of the strip 10 which supports are connected to a tapered (wedge-shaped) detent plate 15, which auxiliary supports (13, 14), along with the rod-like main guiding supports (8, 9), are oriented [perpendicularly] to the [radially] lateral surface of the needle advancer 4. The needle advancer 4 is in the form of a [disc-like] circular sector piece 16 which is rigidly connected to the shaft 3, which sector piece 16 bears tapered (wedge-shaped) plates 17 [(advancing plates)] disposed at an angle to the [radially] lateral surface [of said sector piece 16], which plates 17 are spring-like (or spring-loaded). The [main] shaft 3 is mounted in an antifriction bearing 18 which is in turn mounted in the bushing 5 and (said [main] shaft 3) is disposed in the interior space of the hollow shaft 6 and the body 1, with the possibility of being displaced axially [in space] [(e.g. the possibility of the main shaft 3 (and the bushing 5) being displaced axially)].

4:3f. The arcuate needle guide 2 serves to hold the needle when the needle is withdrawn from the tissues being sutured, and to advance [(aid in the advancing of)] the needle via the spring-loaded tapered (wedge-shaped) plates 17 and to aid in the exertion of mechanical force by said plates 17.

5:4a. The shaft 3 serves to transmit forward and reverse rotational movement to the needle advancing mechanism 4 and [in particular] to the circular sector piece 16. The needle advancer 4 serves to transmit mechanical force and advancing movement to the needle via the spring-loaded tapered (wedge-shaped) plates 17.

The bushing 5 and the hollow shaft 6 serve to convert rotational movement of the hollow shaft 6 to [stepwise longitudinal] advancing movement of the working part of the head assembly (for the automatic device) longitudinally along the incision (wound) which is being sutured, at a time when the entirety of the needle is disposed on the spring-loaded tapered (wedge-shaped) plates 17, and [(as shown in Fig. 2)] is outside of the tissue which is to be sutured.

The detent 7 prevents the bushing 5 from rotating along with the hollow shaft 6 [(if and when said shaft 6 rotates)]. The rod-like main guiding supports (8, 9) serve to support the arcuate needle guide 2 and to prevent movement of the needle in the transverse direction. The strip 10 and the rod-like terminal members (11, 12) serve hold the needle on [(in engagement with)] the tapered (wedge-shaped) plates 17 and to prevent movement of the needle in the [respective] transverse direction.

The auxiliary supports (13, 14) serve to hold the tapered (wedge-shaped) detent plate 15 to the strip 10 [(viz. apparently at a distance from said strip according to the Figures)], and to prevent movement of the needle in the transverse direction. The tapered (wedge-shaped) detent plate 15 allows advancing movement of the needle in one direction only along an arc over the spring-loaded tapered (wedge-shaped) plates 17 when said plates 17 are being moved in forward-and-reverse rotational movement along with the circular sector piece 16 and the [main] shaft 3.

The circular sector piece 16 and the spring-loaded tapered (wedge-shaped) plates 17 serve to transmit advancing movement to the needle, and to transmit mechanical force from the [main] shaft 3 which is moved in forward-and-reverse rotational movement. The antifriction bearing 18 serves to provide for [stepwise longitudinal] advancing movement of the shaft 3 along with the bushing 5, longitudinally along the incision (wound) which is being sutured, while allowing independent rotational movement of the shaft 3 with respect to the bushing 5.

6:4e. The [inventive] head assembly for an automatic device operates as follows:

Shaft 3 is driven in forward-and-reverse rotational movements of c. 10° (angular displacement), by drive means (not shown); these excursions each slightly exceed the distance between successive spring-loaded tapered (wedge-shaped) plates (17, 17) along the [peripheral] arc of the circular sector piece 16. These movements executed by the circular sector piece 16 [(attached to the shaft 3)] are transmitted to the spring-loaded tapered (wedge-shaped) plates 17, the [distal] edges of which are disposed in recesses of the needle [(as they engage said needle)], whereby the needle itself is moved in its

-- Col. 5 --

clockwise forward path. When the spring-loaded tapered (wedge-shaped) plates 17 are moved in the opposite direction (counterclockwise), the needle is not carried along with (is not moved along with) said plates 17, because the needle is held on the bushing 5 [(i.e. is held in coordination with the bushing 5)], by means of the tapered (wedge-shaped) detent plate 15; and/or the needle is not so carried along as a consequence of pressure exerted on the needle by the tissues which are being sutured (which pressure resists such carrying along). When the needle is disposed in its upper position distant from the tissues being sutured, the shaft 3 stops moving [(rotating)], and at that moment a rotation of the hollow shaft 6 causes the bushing 5 (along with the elements connected to it and to the needle) to be displaced longitudinally along the incision (wound) which is being sutured, such displacement being by a fixed distance (step) equal to the [desired] pitch of the stitch being deposited. After this, the forward-and-reverse rotational movement of the shaft 3 is resumed, and the above-described operating cycle is repeated.

Thus, the use of the proposed head assembly for an automatic device enables time savings in the suturing process, while exerting sufficient forces on the needle to suture not only soft biological tissues [but tougher tissues as well]. The [described] head assembly for an automatic device is simple and easy to operate and maintain.

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7:5e. A head assembly for an automatic device for emplacing a surgical suture, comprised of a body having a working part in the form of an arcuate needle guide, and further comprised of a needle advancer (needle advancing mechanism) which is disposed on a shaft; characterized in that,

-- Col. 6--

with the aim of shortening the time of emplacement of the suture, simplifying the design [of the assembly], and facilitating the operation, the head assembly is comprised of:

-- a mechanism for moving (driving) the [said] working part, said mechanism comprising a bushing [(evidently threaded with respect to the hollow shaft)] which is mounted on a hollow shaft which is connected with the body, with the possibility of [said hollow shaft] turning, and, further

-- a detent which is rigidly fixed to the surface of the bushing at its (said detent's) first end and is connected to the body at its second end with the possibility of axial movement, and

-- rod-like main guiding supports rigidly connected to the bushing, which supports bear the arcuate needle guide which needle guide comprises a strip with rod-like terminal members which terminal members are disposed opposite to the rod-like main guiding supports, wherewith the lateral surfaces of the main guiding supports and the terminal members are [all] parallel; and

-- additional (auxiliary) rod-like guiding supports which are disposed at the middle [along the length] of the strip, which supports are connected to a tapered (wedge-shaped) detent plate, which auxiliary supports, along with the rod-like main guiding supports, are oriented [perpendicularly] to the [radially] lateral surface of the needle advancer; wherewith

-- the needle advancer is in the form of a [disc-like] circular sector piece which is rigidly connected to the shaft [(the main shaft, not the hollow shaft)], which sector piece bears tapered (wedge-shaped) plates [(advancing plates)] disposed at an angle to the [radially] lateral surface [of said sector piece], which plates [(advancing plates)] are spring-like (or spring-loaded); and wherewith

-- the [(main)] shaft is mounted in an antifriction bearing which is in turn mounted in the bushing, and (said [main] shaft) is disposed in the interior space of the hollow shaft and the body, with the possibility of being displaced axially [in space] [(e.g. the possibility of the main shaft (and the bushing) being displaced axially)].

СОЮЗ СОВЕТСКИХ СОЦИАЛИСТИЧЕСКИХ РЕСПУБЛИК

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ГОСУДАРСТВЕННЫЙ КОМИТЕТ ПО ИЗОБРЕТЕНИЯМ И ОТКРЫТИЯМ ПРИ ГКНТ СССР

Р 11092

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

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2

(54) ГОЛОВКА АВТОМАТА ДЛЯ НАЛОЖЕНИЯ ХИРУРГИЧЕСКОГО НИТОЧНОГО ШВА

(57) Использование: в медицине. Сущность изобретения: головка содержит корпус с дугообразным игольным направителем, толкателем иглы и приводом, обеспечивающим игле поступательное движение и усилие для прокола тканей. 2 ил.

Изобретение относится к медицине, а именно к хирургии.

Известен хирургический сшивающий аппарат, содержащий корпус, иглообразную матрицу, скобочный магазин, рычаг и толкатель.

Недостатки способа в продолжительности операции сшивания, в сложности настройки аппарата, в относительно громоздкой рабочей части, в использовании для сшивания вместо нити скобы.

Известен сшивающий инструмент, содержащий корпус с рабочей частью в виде дугообразного игольного направителя и размещенного на оси игольного толкателя.

Недостаток способа в невозможности автоматического наложения шва на весь разрез биологических тканей из-за неизбежного проскальзывания протягивающих иглу роликов толкателя, а значит, невозможности автоматического фиксирования момента выхода иглы из тканей. Кроме того, развиваемое усилие ограничено, так как оно определяется лишь трением иглы о ролики толкателя при малой площади поверхности иглы.

Целью изобретения является сокращение времени наложения шва, упрощение конструкции и обеспечение удобства работы.

Цель достигается тем, что в известном устройстве, содержащем корпус с рабочей частью в виде дугообразного игольного направителя и размещенного на оси игольного толкателя, головка содержит механизм перемещения рабочей части, выполненный в виде гайки, установленной на полом винте, соединенном с возможностью вращения с корпусом, и снабженной стопором, жестко закрепленным на поверхности гайки первым концом и связанным с корпусом с возможностью осевого перемещения вторым концом, причем на гайке жестко закреплены основные стержневые направляющие кронштейны с размещенным на них дугообразным игольным направителем, выполненным в виде ленты и стержневых ограничителей, размещенных напротив основных направляющих стержневых кронштейнов и ориентированных параллельно их боковым поверхностям. При этом на середине ленты установлены дополнительные стержневые направляющие кронштейны, связанные со

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стопорной заостренной пластиной и ориентированные вместе с основными направляющими стержневыми кронштейнами к боковой поверхности игольного толкателя, выполненного в виде жестко связанного с осью кругового сектора с расположенными под углом к боковой поверхности пружинными заостренными пластинами, а ось закреплена в подшипнике качения, установленном в гайке, и расположена в полостях винта и корпуса с возможностью осевого перемещения.

На фиг.1 и 2 изображена головка автомата, общий вид.

Головка автомата состоит из корпуса 1 с рабочей частью в виде дугообразного игольного направителя 2 и размещенного на оси 3 игольного толкателя 4, механизма перемещения рабочей части, выполненного в виде гайки 5, установленной на полом винте 6, соединенном с возможностью вращения с корпусом 1, и снабженной стопором 7, жестко закрепленным на поверхности гайки 5 первым концом и связанным с корпусом 1 с возможностью осевого перемещения вторым концом, причем на гайке 5 жестко закреплены основные стержневые направляющие кронштейны 8 и 9 с размещенным на них дугообразным игольным направителем 2, выполненным в виде ленты 10 и стержневых ограничителей 11 и 12, размещенных напротив основных направляющих стержневых кронштейнов 8 и 9 и ориентированных параллельно их боковым поверхностям. При этом на середине ленты 10 установлены дополнительные стержневые направляющие кронштейны 13 и 14, связанные со стопорной заостренной пластиной 15 и ориентированные вместе с основными направляющими стержневыми кронштейнами 8 и 9 к боковой поверхности игольного толкателя 4, выполненного в виде жестко связанного с осью 3 кругового сектора 16 с расположенными под углом к боковой поверхности пружинными заостренными пластинами 17, а ось 3 закреплена в подшипнике 18 качения, установленном в гайке 5, и расположена в полостях винта 6 и корпуса 1 с возможностью осевого перемещения.

Корпус 1 предназначен для сопряжения головки автомата с приводом, сообщающим вращательное и вращательное возвратно-поступательное движение соответственно полому винту 6 и оси 3. Дугообразный игольный направитель 2 предназначен для фиксации иглы при выходе ее из сшиваемых тканей и для сообщения игле через пружинные заостренные пластины 17 поступательного движения и механического усилия.

Ось 3 предназначена для сообщения игольному толкателю 4 и круговому сектору 16 вращательного возвратно-поступательного движения, игольный толкатель 4 – для передачи на иглу через пружинные заостренные пластины 17 механического усилия и поступательного движения.

Гайка 5 вместе с полым винтом 6 служат для преобразования вращательного движения полого винта 6 в поступательное движение рабочей части головки автомата вдоль сшиваемого разреза, когда вся игла расположена на пружинных заостренных пластинах 17 и вне сшиваемых тканей.

Стопор 7 предотвращает прокручивание гайки 5 вместе с полым винтом 6. Основные стержневые направляющие кронштейны 8 и 9 предназначены для крепления дугообразного игольного направителя 2 и для предотвращения смещения иглы в поперечном направлении, лента 10 и стержневые ограничители 11 и 12 для фиксации иглы на пружинных заостренных пластинах 17 и для предотвращения смещения иглы в поперечном направлении.

Дополнительные стержневые направляющие кронштейны 13 и 14 служат для фиксации на ленте 10 стопорной заостренной пластины 15 и для предотвращения смещения иглы в поперечном направлении. Стопорная заостренная пластина 15 обеспечивает поступательное движение иглы только в одном направлении вдоль расположенных по дуге пружинных заостренных пластин 17, когда последние совершают вместе с круговым сектором 16 и осью 3 вращательные возвратно-поступательные движения.

Круговой сектор 16 и пружинные заостренные пластины 17 предназначены для передачи игле поступательного движения и механического усилия совершающей вращательные возвратно-поступательные движения оси 3, подшипник 18 качения – для обеспечения поступательного движения оси 3 вместе с гайкой 5 вдоль сшиваемого разреза при независимом вращательном движении оси 3 по отношению к гайке 5.

Головка автомата работает следующим образом.

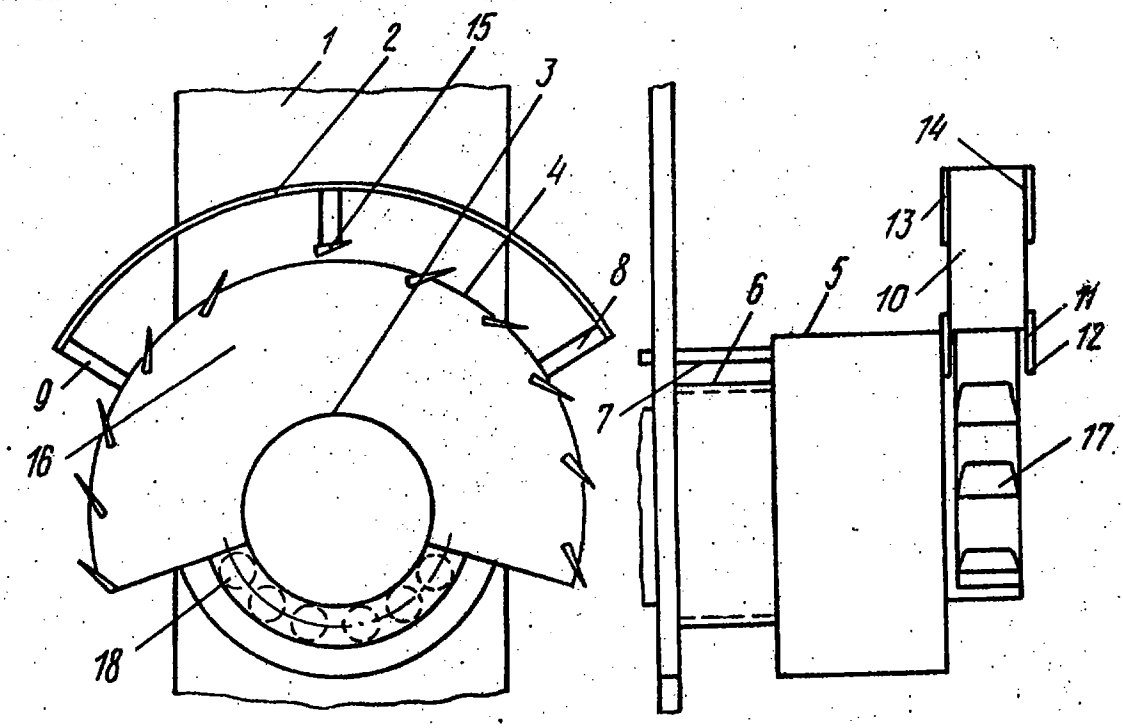
Оси 3 сообщаются через привод (не показан) вращательные возвратно-поступательные движения на угол порядка 10°, т.е. чуть превышающий расстояние между соседними пружинными заостренными пластинами 17 вдоль дуги кругового сектора 16. Эти движения через круговой сектор 16 передаются пружинным заостренным пластинам 17. Края пружинных заостренных пластин 17, расположенные в углублениях насечек иглы, двигают иглу при своем пря-

мом ходе по часовой стрелке. При обратном ходе пружинных заостренных пластин 17 против часовой стрелки игла вместе с ними не смещается за счет фиксированной на гайке 5 с помощью дополнительных стержневых кронштейнов 13 и 14 стопорной заостренной пластины 15 или вследствие сжатия иглы сшиваемыми тканями. Когда игла находится в верхнем положении, удаленном от сшиваемых тканей, ось 3 прекращает свои движения и в этот момент вращение полого винта 6 заставляет гайку 5 вместе с сопряженными с ней элементами и с иглой сместиться вдоль разреза на фиксированное расстояние, равное шагу накладываемого шва, после чего снова возобновляются вращательные возвратно-поступательные движения оси 3, и вышеописанный рабочий цикл повторяется.

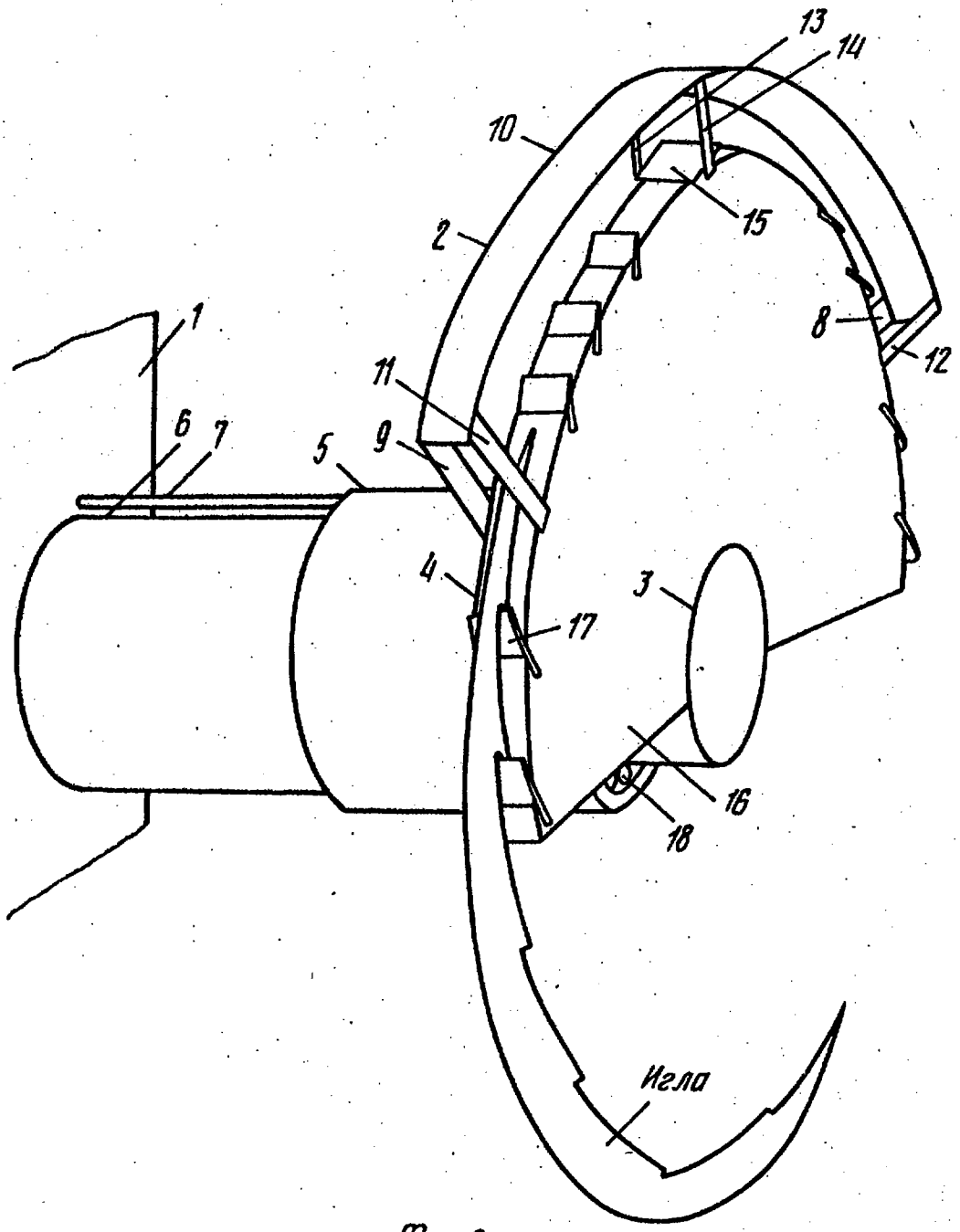
Таким образом, использование предлагаемой головки автомата позволяет сократить время операции сшивания, на иглу действует механическое усилие, достаточное для сшивания не только мягких биологических тканей. Головка автомата проста в эксплуатации.

Формула изобретения

Головка автомата для наложения хирургического ниточного шва, содержащая корпус с рабочей частью в виде дугообразного игольного направителя и размещенного на оси игольного толкателя, отличающаяся тем, что, с целью сокращения времени наложения шва, упрощения конструкции и обеспечения удобства работы, головка содержит механизм перемещения рабочей части, выполненный в виде гайки, установленном на полом винте, соединенном с возможностью вращения с корпусом, и снабженной стопором, жестко закрепленным на поверхности гайки первым концом и связанным с корпусом с возможностью осевого перемещения вторым концом, причем на гайке жестко закреплены основные стержневые направляющие кронштейны с размещенным на них дугообразным игольным направителем, выполненным в виде ленты и стержневых ограничителей, размещенных напротив основных направляющих стержневых кронштейнов и ориентированных параллельно их боковым поверхностям, при этом на середине ленты установлены дополнительные стержневые направляющие кронштейны, связанные со стопорной заостренной пластиной и ориентированные вместе с основными направляющими стержневыми кронштейнами к боковой поверхности игольного толкателя, выполненного в виде жестко связанного с осью кругового сектора с расположенными под углом к боковой поверхности пружинными заостренными пластинами, а ось закреплена в подшипнике качения, установленном в гайке, и расположена в полостях винта и корпуса с возможностью осевого перемещения.



Фиг.1



Фиг.2

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